

What is claimed is:

1. A method of creating a non-hydrochlorofluorocarbon refrigerant mixture, capable of providing temperatures as low as about -150° C, comprising the steps of:

adding non-hydrochlorofluorocarbon refrigerants to refrigerant R740.

2. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

3. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

4. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

5. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

6. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R134a, R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

7. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consists of:

R14;

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R134a, R152a and R290; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

8. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consists of:

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R134a, R152a and R290; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

9. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

10. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consists of:

R14;

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

11. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

12. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

13. The refrigerant mixture of claim 1, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

14. A non-hydrochlorofluorocarbon refrigerant mixture for use in a refrigeration system capable of providing temperatures as low as about -150° C, consisting of:

R740 and at least four non-hydrochlorofluorocarbon refrigerants.

15. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

16. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

17. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

18. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

19. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R134a, R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

20. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R134a, R152a and R290; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

21. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R134a, R152a and R290; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

22. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

23. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

24. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R14;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

25. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

26. The refrigerant mixture according to claim 14, wherein said non-hydrochlorofluorocarbon refrigerants consist of:

R50;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

27. A refrigeration heat exchanger section useful in circulating a non-hydrochlorofluorocarbon refrigerant mixture which comprises: a compressor means, an auxiliary condenser connected to said compressor means, a liquid/gas separator connected to said auxiliary condenser, a first condenser
5 connected to said liquid/gas separator, a second condenser connected to said first condenser, a third condenser connected to said second condenser, and a subcooler means connected to said third condenser, wherein the improvement is characterized by:

a means for distributing a subcooled non-hydrochlorofluorocarbon

refrigerant liquid mixture from said liquid/gas separator to a first expansion means and a second expansion means for forming first and second expanded streams, respectively;

- 5 a first conduit means for returning said first expanded stream to said auxiliary condenser and said compressor; and
- a second conduit means for delivering said second expanded stream to said first condenser.

28. The refrigeration heat exchanger section according to claim 27,
10 wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

29. The refrigeration heat exchanger section according to claim 27,
wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

30. The refrigeration heat exchanger section according to claim 27, wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

31. The refrigeration heat exchanger section according to claim 27, wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

R50;

any one refrigerant from the group consisting of R134a; R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

32. The refrigeration heat exchanger section according to claim 27, wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R50;

any one refrigerant from the group consisting of R134a, R152a and R290;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

33. The refrigeration heat exchanger section according to claim 27, wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R134a, R152a and R290; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

34. The refrigeration heat exchanger section according to claim 27, wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R50;

any one refrigerant from the group consisting of R236ea, R245ca and R245fa;

any one refrigerant from the group consisting of R227ea, R236fa, RC318, R600 and R600a;

any one refrigerant from the group consisting of R134a, R152a and R290; and

any one refrigerant from the group consisting of R23, R116, R170, R508a, R508b and R1150.

35. The refrigeration heat exchanger section according to claim 27,
wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

any one refrigerant from the group consisting of R134a; R152a and
R290;

any one refrigerant from the group consisting of R227ea, R236fa,
RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and
R245fa; and

any one refrigerant from the group consisting of R23, R116, R170,
R508a, R508b and R1150.

36. The refrigeration heat exchanger section according to claim 27,
wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

R50;

any one refrigerant from the group consisting of R236ea, R245ca and
R245fa;

any one refrigerant from the group consisting of R227ea, R236fa,
RC318, R600 and R600a; and

any one refrigerant from the group consisting of R23, R116, R170,
R508a, R508b and R1150.

37. The refrigeration heat exchanger section according to claim 27,
wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R14;

any one refrigerant from the group consisting of R227ea, R236fa,
RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and
R245fa; and

any one refrigerant from the group consisting of R23, R116, R170,
R508a, R508b and R1150.

38. The refrigeration heat exchanger section according to claim 27,
wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R50;

any one refrigerant from the group consisting of R134a; R152a and
R290;

any one refrigerant from the group consisting of R236ea, R245ca and
R245fa; and

any one refrigerant from the group consisting of R23, R116, R170,
R508a, R508b and R1150.

39. The refrigeration heat exchanger section according to claim 27,
wherein said non-hydrochlorofluorocarbon refrigerant mixture comprises:

R50;

any one refrigerant from the group consisting of R227ea, R236fa,
RC318, R600 and R600a;

any one refrigerant from the group consisting of R236ea, R245ca and
R245fa; and

any one refrigerant from the group consisting of R23, R116, R170,
R508a, R508b and R1150.